TN Department of Environment & Conservation

November 9, 2016

Lynne Liddington
Knox County Air Quality Management Division
140 Dameron Ave Suite 242
Knoxville, TN 37917

Reference: Third Quarter 2016 Performance Audits/ TDEC

Dear Ms. Liddington:

The following pages contain the results from performance audits conducted by personal from Tennessee's Air Quality Assurance Section on September 13th and 14th of this year. The audits were performed throughout Knox County on ozone and particle monitors. The results were noted in the instrument log books and stated in this report. The audit report is grouped in two sections, gas and particle monitors.
The audit yielded three deficiencies:

1. The main flow on TEOM serial # 20953 was out of the acceptable limits of ±4% of the transfer standard.
2. The current time on 2025 serial # 22576 was out of the acceptable limits of ± 1 minute.
3. The Springhill ozone analyzer at the level two audit concentration was over the ±1.5ppb limit sited in the EPA Technical Memo released on 05/03/2016.

TDEC Recommendations:

1. Calibrate the main flow on TEOM #20953. Amber said they were working with Thermo to correct problems with their KO kit which is used to calibrate the flows on the TEOM.
2. Adjust the current time on 2025 # 22576 with a NIST traceable device. Recommend incorporating time checks into monthly maintenance or field blank days.
3. Even though the flows on the TSP's were within acceptable ranges, the measured flows were low. Recommend the replacement of the TSP motors in the near future.

The EPA stated that data in AQS would NOT be invalidated if a monitor unsuccessfully meets the acceptable limits at the lower audit levels 1&2. I will contact Amber to schedule our next performance audits which should be the first quarter of next year.
If we can be of any further assistance or should there be questions regarding this audit, please email at Lance.Allen@tn.gov or call (615)687-7040.
Sincerely,

D. Lance Allen
Environmental Consultant
Quality Assurance Section

CC: A. Talgo, Knox CO, R .Brawner APC, J. Stephens APC,

TN Department of Environment & Conservation

Date: November 9, 2016
To: Lynne Liddington
From: Lance Allen
Subject: Quality Assurance Performance Audit/Knoxville Local/Ozone
Site: 47-093-0021 Knoxville East/47-093-1020 Springhill

On September 13, 2016, personnel from the Quality Assurance section conducted performance audits on selected ozone monitors. The following is a summary of the parameters and values measured.

Site, Instrument, & Audit Date	Parameter	Audit Point	Monitor Response	Difference	Acceptable Range
47-093-0021	Ozone (O3)	.105ppm	.107ppm	1.9%	±15%
East Knox/Teledyne		.081	.082	1.2%	±15%
400e/serial# 2014		.035	.037	5.7%	±15%
9-13-16		.000	.001	.001ppm	±.005ppm
Data Logger ESC	Lab Temp	26.6°C	28.0°C	1.4°C	±2°C
8832S#A6757K#2	Time	08:42:00	08:41:21	-39 sec	± 60 sec
47-093-1020	Ozone (O3)	.100ppm	.099ppm	-1.0%	±15%
Springhill/Teledyne		.075	.074	-1.3%	±15%
400e/serial# 2013		.055	.054	-1.8%	±15%
9-13-16		.008	.006	**-2ppb**	±1.5ppb
		.000	.000	.000ppm	±.005ppm
Data Logger ESC	Lab Temp	24.2°C	24.9°C	0.7°C	±2°C
8832 #2 S#A3758K	Time	09:34:00	09:33:35	-25 sec	± 60 sec

Remarks:

1. **The Springhill ozone level two audit concentration was over the ±1.5ppb limit sited in the EPA Technical Memo released on 05/03/2016. The EPA stated that data in AQS would NOT be invalidated if a monitor unsuccessfully meets the acceptable limits at the lower audit levels 1&2.**
2. The East Knoxville ozone monitor showed satisfactory correlation with our audit standards.
3. Both sites were very clean; log books were present and properly noted.

Recommendations:

1. None.

If we can be of any further assistance or should there be questions regarding this audit, please email or call.
Lance.Allen@tn.gov
(615)687-7040

KXO3091316

cc: A. Talgo, Knox CO, R. Brawner, APC, J. Stephens, APC
***Equipment used to conduct these audits can be found on the Traceability page at the end of this report.**

TN Department of Environment & Conservation

Date: November 9, 2016
To: Lynne Liddington
From: Lance Allen
Subject: Quality Assurance Performance Audit
Site: Knoxville Particle Sites

On September 13rd and 14th, 2016, personnel from the Quality Assurance section conducted performance audits on selected ambient air monitors. The following is a summary of the parameters and values measured.

Site, Instrument, and audit date	Measured Parameter	Audit Value	Monitor Display	Difference	Acceptable Range
Air Lab 470931013	Current Time	13:53:14 est	13:53:00 est	-14 sec	±5 min
Teom 1405	Ambient Temp.	31.6°C	31.4°C	-0.2°C	±2°C
serial # 20953	Bar. Press.	741 mm	736 mm	-5 mm	±10mm
9-13-16	Main Flow	3.20 lpm	3.00 lpm	**-6.3%**	±4%
	By Pass Flow	14.09 lpm	13.65 lpm	-3.1%	±4%
	Total Flow	17.34 lpm	16.65 lpm	-4.0%	±4%
	Design Flow	16.67 lpm	16.65 lpm	-0.1%	±5%
2025 serial #22576	Current Time	12:22:00 est	12:20:05 est	**-115 sec**	±1 min
9-13-16	Ambient Temp.	31.2°C	30.6°C	-0.6°C	±2°C
	Filter Temp.	33.7 °C	34.2 °C	0.5°C	±2°C
	Comp. Temp.	32.6 °C	32.8 °C	0.2°C	±2°C
	Bar. Press.	740 mm	739 mm	-1 mm	±10mm
	Transfer Flow	17.04 lpm	16.70 lpm	-2.0%	±4%
	Design Flow	16.67 lpm	16.70 lpm	0.2%	±5%
	Ext. Leak Check	Passed	Passed	4 mmHg/min	±25 mmHg/min
PM10s#3619/lab/O	Trans. Std. Flow	37.85 sf^3/m	37.80 sf^3/m	-0.1%	±7%
9-13-16	Design Flow	1.13 m^3/m	1.07 m^3/m	-5.3%	±10%
PM10s#999/lab/C	Trans. Std. Flow	37.93 sf^3/m	38.23 sf^3/m	0.8%	±7%
9-13-16	Design Flow	1.13 m^3/m	1.08 m^3/m	-4.4%	±10%
Thermo Beta 5014i	Current Time	12:58:05 est	12:58:00 est	-05 sec	±5 min
Serial#cm14521015	Ambient Temp.	32.2°C	31.0°C	-1.2°C	±2°C
9-13-16	Bar. Press.	740 mm	737 mm	-3 mm	±10mm
	Trans. Std. Flow	16.84 lpm	16.65 lpm	-1.1%	±10%
Rule 470931017	Current Time	07:31:00 est	07:30:13 est	-47 sec	±1 min
2025 serial #22654	Ambient Temp.	25.3°C	25.4°C	0.1°C	±2°C
9-14-16	Filter Temp.	26.2 °C	24.7 °C	-1.5°C	±2°C
	Comp. Temp.	27.1 °C	28.6 °C	1.5°C	±2°C
	Bar. Press.	736 mm	735 mm	-1 mm	±10mm
	Transfer Flow	16.69 lpm	16.70 lpm	0.1%	±4%
	Design Flow	16.67 lpm	16.70 lpm	0.2%	±5%
	Ext. Leak Check	Passed	Passed	9 mmHg/min	±25 mmHg/min
TSPs#1938/Rule	Trans. Std. Flow	35.60 sf^3/m	38.67 sf^3/m	**8.6%**	±7%
9-14-16	Re Audit	36.72 sf^3/m	38.51 sf^3/m	4.9%	±7%

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Site & Instrument	Measured Parameter	Audit Value	Monitor Display	Difference	Acceptable Range
Burnside					
470930027					
TSP serial#2875	Trans. Std. Flow	38.46 sf^3/m	38.19 sf^3/m	-0.7%	±7%
TSP serial#4302	Trans. Std. Flow	36.82 sf^3/m	38.38 sf^3/m	4.2%	±7%
9-14-16					
Ameristeel					
470930031	Trans. Std. Flow	36.63 sf^3/m	38.95 sf^3/m	6.3%	±7%
TSP serial#4304					
9-14-16					
Breaden	Current Time	09:57:00 est	09:56:29 est	-31 sec	±1 min
470930028	Ambient Temp.	28.0°C	27.3°C	-0.7°C	±2°C
2025 serial#21894	Filter Temp.	29.7 °C	29.8 °C	0.1°C	±2°C
9-13-16	Comp. Temp.	29.2 °C	30.4 °C	1.2°C	±2°C
	Bar. Press.	740 mm	740 mm	0 mm	±10mm
	Transfer Flow	16.64 lpm	16.69 lpm	0.3%	±4%
	Design Flow	16.67 lpm	16.69 lpm	0.1%	±5%
	Ext. Leak Check	Passed	Passed	8 mmHg/min	±25 mmHg/min
2025 serial#21893	Current Time	10:22:00 est	10:21:29 est	-31 sec	±1 min
9-13-16	Ambient Temp.	30.2°C	29.1°C	-1.1°C	±2°C
	Filter Temp.	31.3 °C	31.3 °C	0.0°C	±2°C
	Comp. Temp.	30.2 °C	30.3 °C	0.1°C	±2°C
	Bar. Press.	740 mm	739 mm	-1 mm	±10mm
	Transfer Flow	16.75 lpm	16.59 lpm	-1.0%	±4%
	Design Flow	16.67 lpm	16.59 lpm	-0.5%	±5%
	Ext. Leak Check	Passed	Passed	5 mmHg/min	±25 mmHg/min
Springhill	Current Time	10:30:00 est	10:30:01 est	01 sec	±1 min
470931020	Ambient Temp.	32.4°C	31.7°C	-0.7°C	±2°C
2025 serial#21892	Filter Temp.	35.8 °C	35.9 °C	0.1°C	±2°C
09-14-16	Comp. Temp.	35.7 °C	35.4 °C	-0.3°C	±2°C
	Bar. Press.	735 mm	739 mm	4 mm	±10mm
	Transfer Flow	16.68 lpm	16.70 lpm	0.1%	±4%
	Design Flow	16.67 lpm	16.70 lpm	0.2%	±5%
	Ext. Leak Check	Passed	Passed	19 mmHg/min	±25 mmHg/min
URG S#3n-	Current Time	10:54:36 est	10:54:00 est	-36 sec	±5 min
b0409/b0224/b0528	Ambient Temp.	29.3°C	30.2°C	0.9°C	±2°C
09-13-16	Bar. Press.	738.5 mm	735.9 mm	-2.6 mm	±10mm
	L. Check	625 mm	608 mm	17/Pass	225 mm
	Transfer Flow	22.29 lpm	22.28 lpm	-0.1%	±10%
Super Sass	Current Time	10:27:52 est	10:25:00 est	-112 sec	±5 min
S#g9188/g9148	Ambient Temp.	29.5°C	28.5°C	-1.0%	±2°C
09-13-16	Filter Temp. 1	29.6°C	30.3°C	0.7 °C	±2°C
	Filter Temp. 2	29.7°C	30.4°C	0.7 °C	±2°C
	B. Press	739 mm	734 mm	-5 mm	±10mm
	Transfer Flow 1	6.85 lpm	6.7 lpm	-2.2%	±10%
	Transfer Flow 2	6.90 lpm	6.7 lpm	-2.9%	±10%
	Leak Check 1	0.0	0.0	0.0/Pass	0.1 lpm
	Leak Check 2	0.0	0.0	0.0/Pass	0.1 lpm

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Remarks:

1. **TEOM serial # 20953 was out of limits in accordance with 40 CFR Part 50 App L Sec 9.2.5, ±4% of transfer standard. The flow was verified with three different flow standards with the same results.**
2. **2025 serial # 22576 was out of limits in accordance with 40 CFR Part 50 App L Sec 7.4 clock ± 1 minute.**
3. All other differences between monitors and audit values were within acceptable limits.
4. All PM 10 inlets, cyclones, and cabinet interiors were clean on the 2025's and other particle monitors.
5. Log books were present, activities noted and dated with initials.

Recommendations:

1. Calibrate the main flow on TEOM #20953. Amber said they were working with Thermo to correct problems with their KO kit which is used to calibrate the flows on the TEOM.
2. Adjust the current time on 2025 # 22576 with a NIST traceable device. Recommend incorporating time checks into your monthly maintenance or field blank days.
3. Even though the flows on the TSP's were within acceptable ranges, the measured flows were low. Recommend replacing the motors in the near future.

If we can be of any further assistance or should there be questions regarding this audit, please email or call.
Lance.Allen@tn.gov
(615) 687-7040

KX091316P

cc: A. Talgo, Knox CO
R. Brawner, APC
J. Stephens, APC

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Audit Traceability

Site & AQS #	Instrument Audited	Auditor	Audit Equipment
East Knox 470930021	O3/Teledyne 400E/#2013	D. Allen	Environics 6103/#6371 Streamline Pro #M060504
Springhill 470931020	1. O3/Teledyne 400E/#2014	1. B. Stimson	1. Teledyne 750U/#71 Streamline Pro #M150304
	2.URG 3000N # 3N-B0409,B0224,B0528	2. D. Allen	2.TetraCal #162
	3. 2025 #21892	3. D. Allen	3. Streamline Pro #M060504
	4. Super Sass S#g9188/g9148	4. D. Allen	4. TetraCal #162
Breaden 470930028	2025's #21894 & #21893	B. Stimson	Streamline Pro #M150304
Air Lab 470931013	1. 2025 #22576	1. B. Stimson	1. Streamline Pro #M150304
	2. TEOM 1405 #20953	2. B. Stimson & D. Allen	2. Streamline Pro #M150304 *Streamline Pro #M060504
	3. Thermo 5014i #cm14521015	3. B. Stimson & D. Allen	3. Streamline Pro #M150304
	4. PM 10's #3619 & #999	4. D. Allen	4. Orifice #10337 & Streamline Pro #M150304
Rule 470931017	2025 #22654 & TSPs#1938	D. Allen	Orifice #10337 & Streamline Pro #M150304
Burnside 470930027	TSP #2875 & #4302	D. Allen	Orifice #10337 & Streamline Pro #M150304
Ameristeel 470930031	TSP #4304	D. Allen	Orifice #10337 & Streamline Pro #M150304

*Verified the flow with a secondary standard.
**All current time was verified through web site www.time.gov .